Curling behaviour of circular metal tubes

ABSTRACT

An energy absorber device is a device that is capable to convert one form of energy to the plastic deformation or another form of energy. Plastic deformation energy can be converted into several modes of deformation including axial crushing, inversion, splitting, lateral indentation and lateral flattening. The objective of this paper was to investigate the axial splitting and curling behavior of aluminium circular metal tubes which was compressed axially under static loading. An experimental investigation was carried out by using three types of dies with different semi-angles, Î± which was 45Â°, 60Â° and 75Â°. To ease the splitting process, the tube was introduced with 4 and 6 slits with the length of 5 mm at the leading edge of the tube. The slit prevented the tubes from buckling and established the split and curl mode during the compression process. The result showed that for a specimen with 4 initial saw cuts, the number of slits remained except for semi angle die of 600 where it branched into 6 splits. Meanwhile for a specimen with 6 initial saw cuts, the effect of semi angle die was insignificant where the number of slits remained the same after compression. The mean load was found proportional to the semi angle die. In conclusion, the axial splitting and curling of aluminium circular metal tubes has high potential as an energy absorber.

Keyword: Axial loading; Curling; Deformation; Semi-angles; Slits